# TVA EnerNOC Demand Response Program

**Updated Q1 2018**

# The Enel Group Worldwide

A multinational power company and leading integrated player in the world's power and gas markets


## Overview

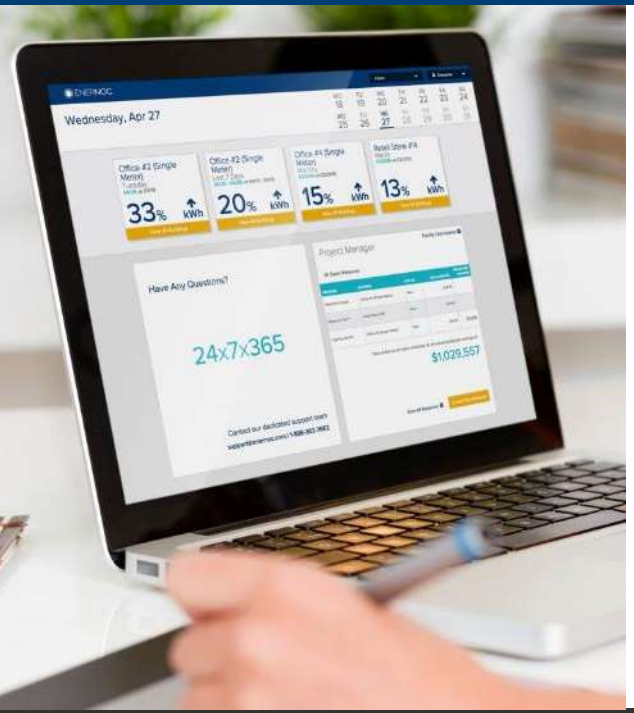
- Second largest global utility by revenue
- More than 50 years of experience
- Global leader in renewable energy generation
- #20 on Fortune's Change the World List
- May 2017: Launched e-Solutions, new business unit focused on value added services
- August 2017: Acquired EnerNOC to build on EnerNOC's position as a leader in B2B energy solutions

## World Class Team and Resources

- US $83.91 / EUR €70.1 B in revenue
- More than 63,000 employees operating in 31 countries across 5 continents
- Net installed capacity of more than 82 GW in electricity and gas
- Global leadership in renewables with 36 GW in consolidated renewables capacity

# EnerNOC, an Enel Group Company

A global leader in demand response and pioneer of energy intelligence software and services




### Proven Client Track Record

- 50+ DR programs in 10 countries
  - 4,000+ MWs of curtailable load
- 1,100+ software subscription customers
- More than US $1B in customer payments/ savings to date
- Streaming data from +14,000 enterprise sites
- Managing 1M bills annually with UBM

### Full Value and Technology Offering

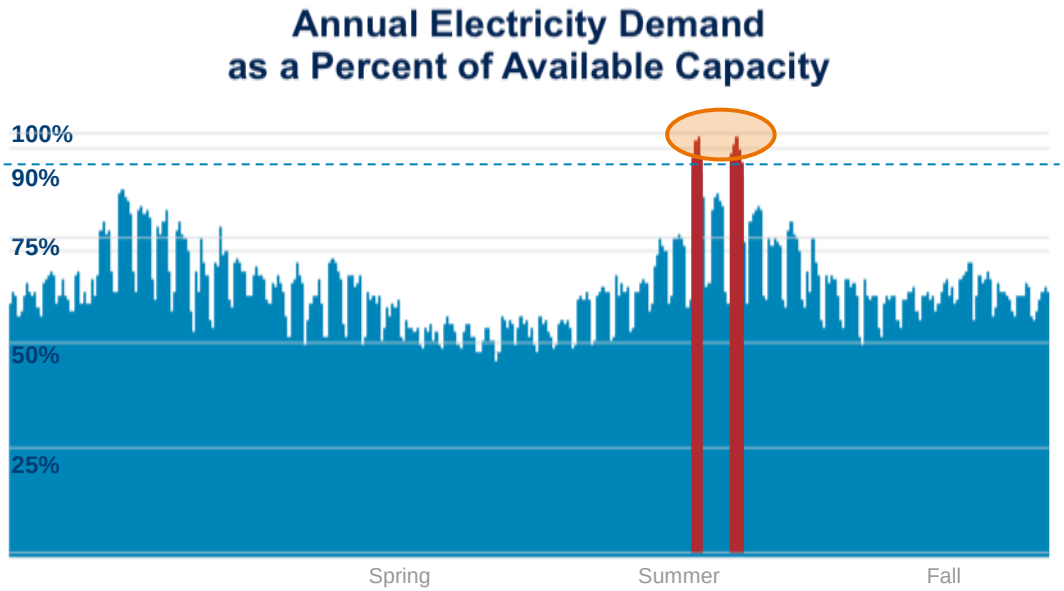
- Energy intelligence platform and applications
- Combines technology, professional services, and market access
- More than US$200M invested in to date technology
- 24x7x365 Network Operations Center & customer support

### World Class Team and Resources

- US $404M revenue in 2016
- US $98M cash and cash equivalents on balance sheet
- More than 1,000 employees in offices across 10 countries

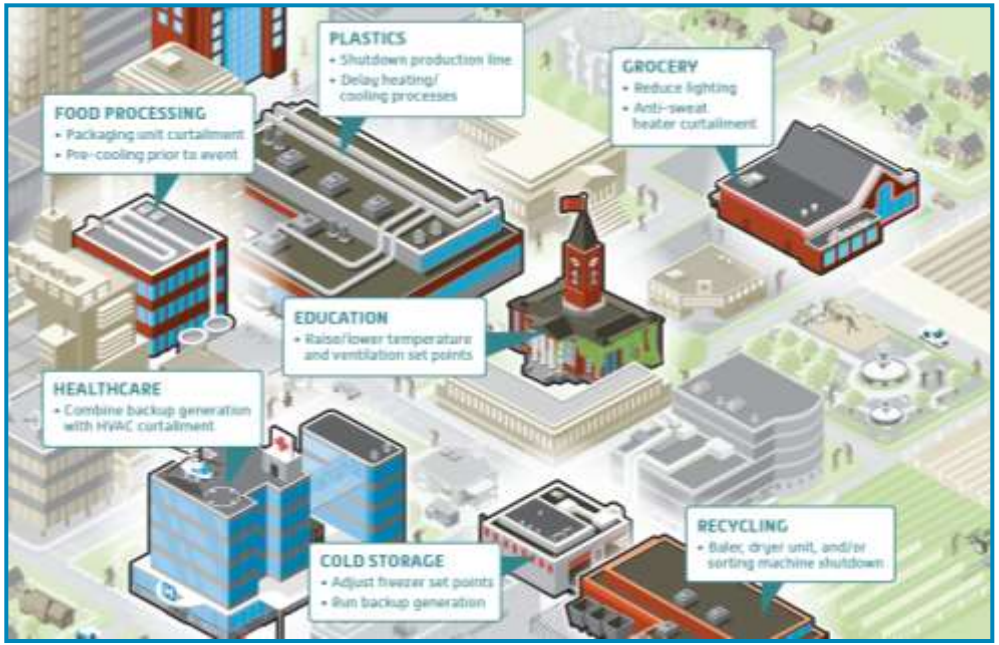
# Intro to Demand Response

# The Value of Demand Response




- More than 10% of grid infrastructure costs are spent to meet peak demand that occurs less than 1% of the time.
- Building a new power plant for that 1% of the time is incredibly expensive.
- Demand response is a fast and cost-effective way to meet peak electric demand.

# How Demand Response Works

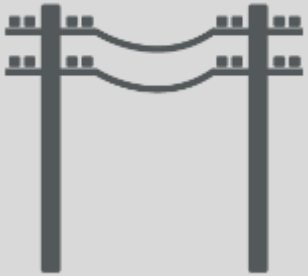



When the electric grid needs resources, EnerNOC “dispatches” its network of resources, and thousands of facilities across nearly every industry reduce their electricity consumption.

# Benefits of Demand Response

**Earn Payments to Subsidize Tight Budgets**

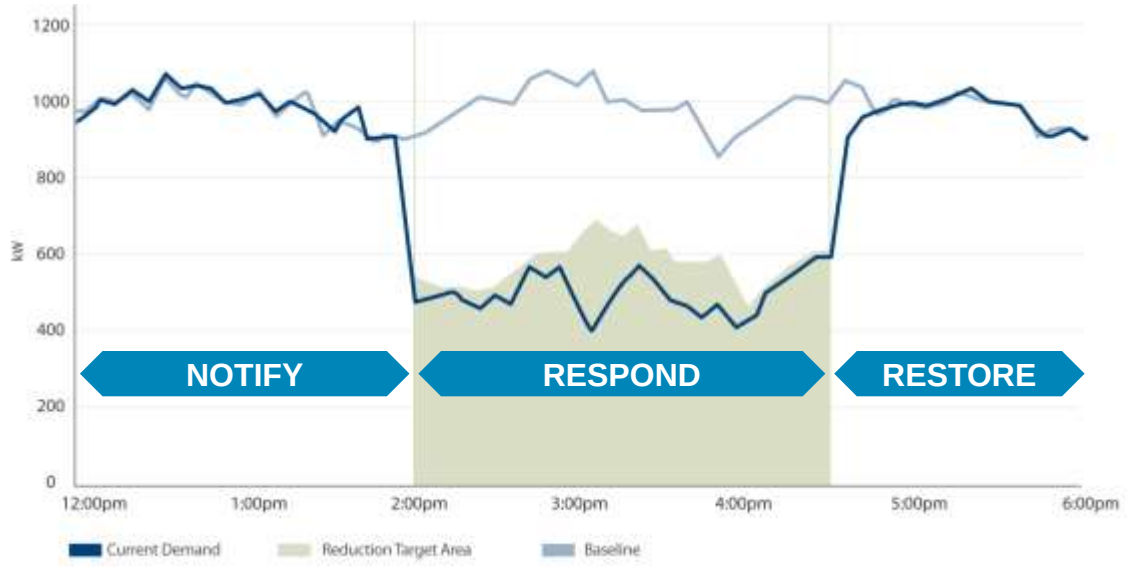
**Operational Reliability & Advance Warning**



**Strengthen the Grid & Serve Your Community**

**Support Environmental Sustainability**

# How Demand Response Dispatches  Work




- **Notify**: When an event is called, we immediately notify your facility contacts via phone, text and/or email.
- **Respond**: Your facility responds by curtailing load manually or automatically.
- **Restore**: When the event is over, operations are returned to normal levels.

# Maximize Dispatch Performance

EnerNOC drives bottom line impact through revenue assurance and maximization.


The value in demand response is realized through sound execution.

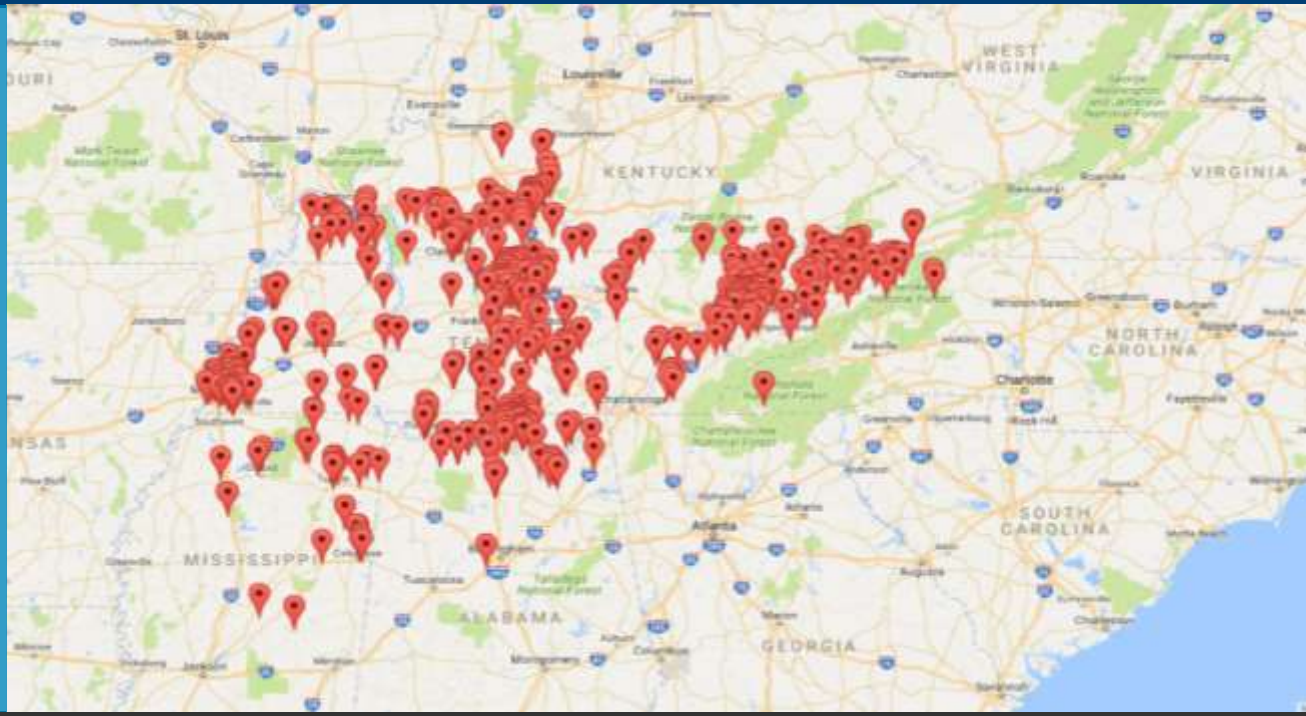
- We work with you to design an energy reduction strategy based on your energy assets and operations.
- We provide personalized coaching from our experienced team during a dispatch.

# TVA-EnerNOC Demand Response Program

Delivered more than $35 million in savings to participating organizations

## By-the-Numbers

- Service Territory:
  80,000 square miles
- Participating LPCs
  118 (of 154)
- Peak Demand:
  33,482 MW
- Sites:
  1,300 facilities
- Performance
  >99%



# TVA

## TVA-EnerNOC Demand Response

| TVA-EnerNOC Demand Response | |
|---|---|
| **Territory** | Tennessee, parts of Kentucky, North Carolina, Georgia, Alabama, Mississippi, and Virginia |
| **Demand Response Types** | Curtailment and permitted generation |
| **Payments** | **Capacity Payments** (for being on stand-by): $24/kW-yr<br>**Energy Payments** (for dispatch performance): heat rate x gas index, currently $40-50/MWh<br>$225/MWh or more for emergency energy |
| **Costs** | No up-front, out of pocket costs to participate |
| **Program Period & Hours** | **Summer**: Apr – Oct: 12:00 PM – 8:00 PM CT<br>**Winter**: Nov - Mar: 5:00 AM – 1:00 PM CT |
| **Dispatch Notification** | 30 minutes |
| **Response Duration** | 2 – 8 hours |
| **Maximum Dispatches** | 1 event per day; no more than 2 dispatches in 2 consecutive business days<br>6 events per month; 40 economic hours per year |
| **Annual Dispatch Frequency** | 8 – 12 dispatches on average |
| **Testing Requirement** | One acceptance test required prior to program enrollment |

# BUGs are Back: Enroll your Diesel Generator

Qualified diesel generators can be participate in DR…if it meets any of the criteria below

## Commenced construction before June 12, 2006 (RICE NESHAP)

- Engine < 300 hp
- Engine rated Tier 2 or Tier 3

## Commenced construction on or after June 12, 2006 (NSPS)

- Engine rated Tier 2 or Tier 3 (if manufactured before 2011)
- Engine rated Tier 1 (if manufactured between 4/1/06 and 12/31/10)

- Engine rated Tier 4, or Tier 4i (regardless of construction date)

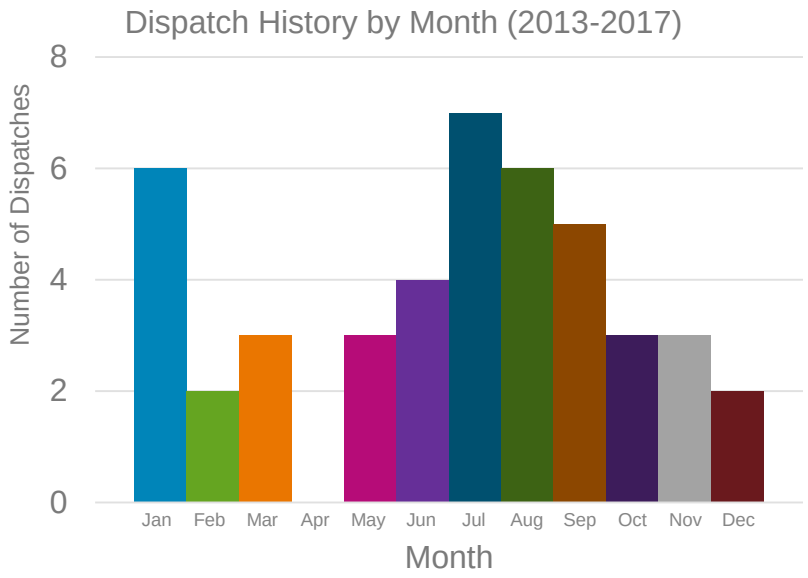
# TVA Demand Response Dispatch History

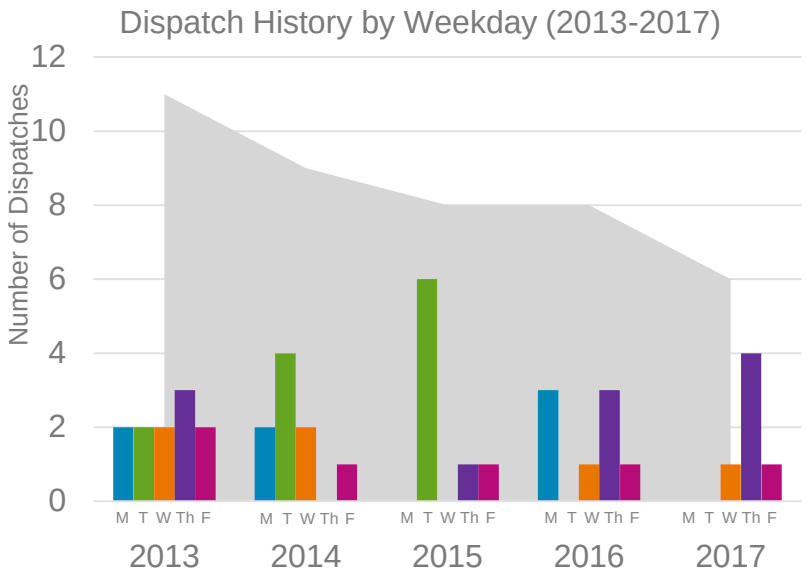
| | Number of DR Events | Avg. Duration (Hrs.) | Max Duration (Hrs.) |
|---|---|---|---|
| **2011** | 5 | 3.4 | 4 |
| **2012** | 4 | 3.2 | 4 |
| **2013** | 11 | 3.6 | 4 |
| **2014*** | 11 | 3.5 | 6 |
| **2015** | 8 | 3.5 | 8 |
| **2016** | 8 | 3.6 | 5 |
| **2017** | 6 | 3.5 | 4 |
| **Total** | 53 | 3.5 | 8 |

** Includes 2 voluntary dispatches of 7 hours total*

# When Can You Expect a Dispatch

>50% of dispatches occur in Jun-Sept; or on a Tuesday or Thursday

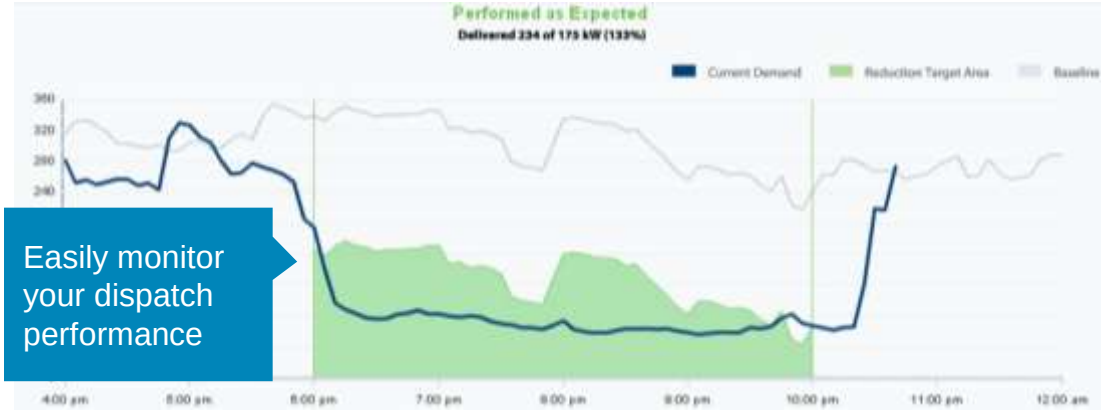


# The Value of Real-time Energy Data

# Real-time DR Performance

The information you need to perform your best during DR events

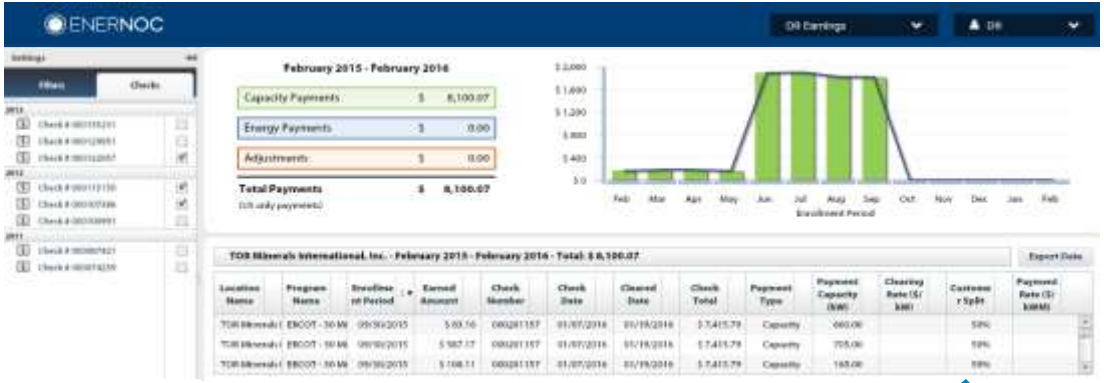



Easily monitor your dispatch performance

- View and manage DR performance data in real-time to maximize revenue.
- Track all active DR registrations, performance, contact information and energy reduction plans.
- Dispatch coaching and 24x7x365 support from EnerNOC to help you meet your curtailment goals.

# Payment Tracking

Quantify the value DR performance brings to your organization

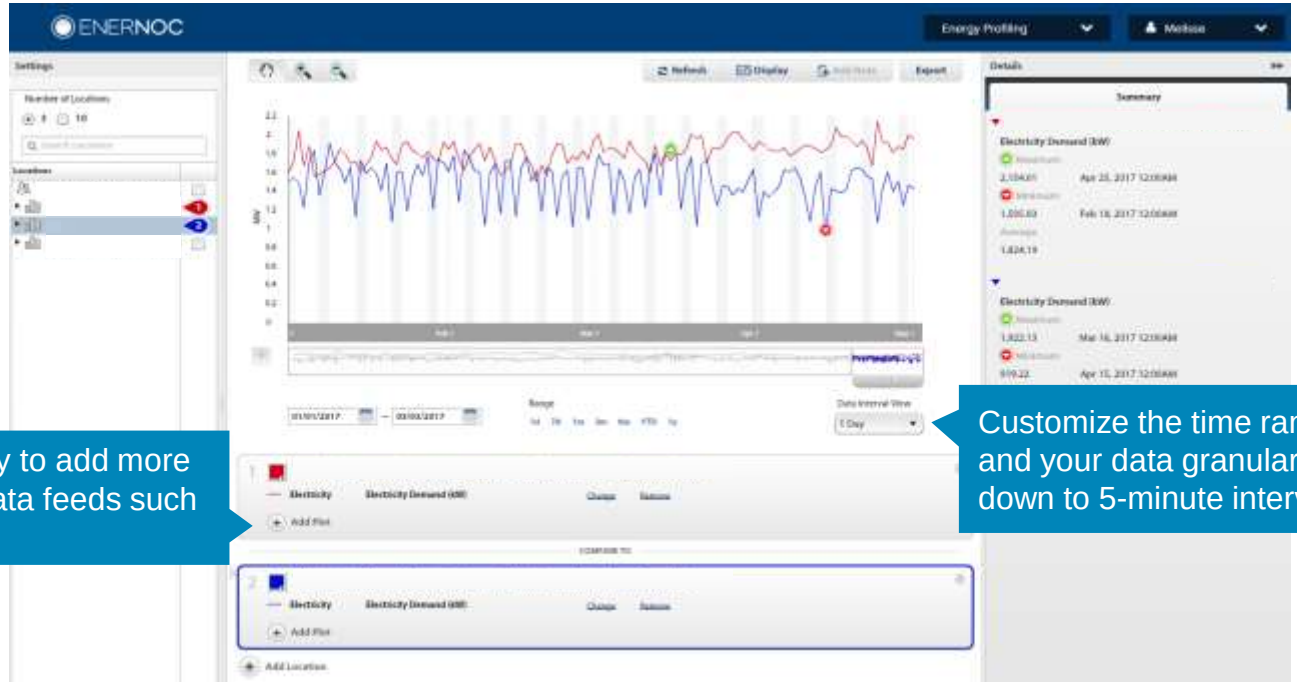



Detailed earnings and payment info at your fingertips

View and export your earnings data 24x7x365

- View earned revenue and payment history online, on demand.
- Connect your DR participation to revenue earned.
- Track detailed earning by site, program, or custom date range.

# Energy Profiling: Make the Most of your Interval Data



# Make the Most of your Interval Data

**Lower Peak Demand**:  Proactively manage your peak demand, 15-40% of your electric bill

- Analyze where and when peaks occur to avoid costly demand charges.
- Identify phantom loads to prevent energy waste during non-production hours.

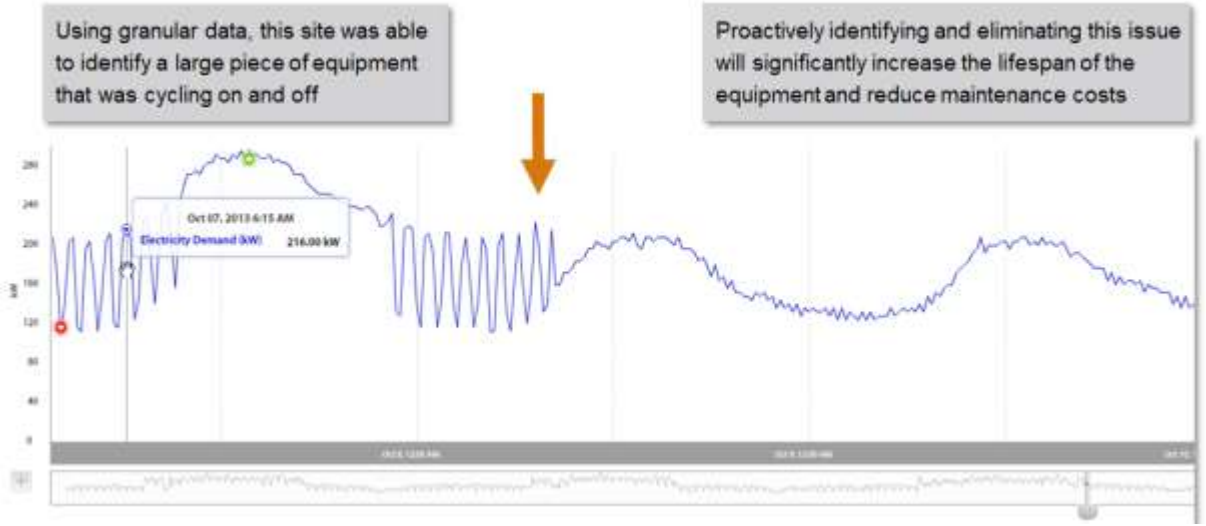
# Make the Most of your Interval Data

**Optimize Site Performance**: Identify underperforming sites and achieve continuous energy savings


- Identify efficiency opportunities.
- Track changes over time to ensure savings persist after efficiency measures have been implemented.

# Make the Most of your Interval Data

**Protect Your Equipment**: Avoid costly maintenance and extend the lifespan of your equipment




- Zoom into your data to spot .
- Track changes over time to ensure savings persist after efficiency measures have been implemented.

# Case Studies

# A Snapshot of Our Expertise

Water Treatment Facilities

- **EnerNOC Experience**
  - 235 MW of DR Capacity
  - +400 Customers
- **Typical DR Participation Strategies**
  - Reduce pump usage temporarily in part or full: Influent, RAS and WASS, Digester Mixing, Heating
  - Curtail ultraviolet lighting and air-handling fans
  - Transfer load to permitted back-up generation

- **Just a few of our customers**

# Customer Spotlight:
# Eastern Municipal Water District


**Water District Works with EnerNOC to Reduce Significant Electrical Load**

> “It’s very expensive to build new electrical generation facilities, and it’s definitely not as expensive to curtail energy and avoid problems that affect the broader community.
>
> Demand response is a key strategy that helps us curtail energy use—without any impact on service. It makes real sense for us.”

**Industry**
Water District

**Geography**
Southern California

**Annual Energy Spend**
$10 million

*https://www.enernoc.com/sites/default/files/media/pdf/case-studies/P14134_CS_emwd.pdf*

## Key Results & Benefits

- $100,000 in DR payments annually
- No-risk, no-penalty participation

# Customer Spotlight: Lodge Cast Iron

**Manufacturer cuts $1M annual energy budget with EnerNOC**

> We may be making the same product we made 118 years ago, but we're continually looking to incorporate new technologies in our business.
>
> By using EnerNOC's software in conjunction with our own in-house monitoring, we've saved almost 7.5M kWh - a reduction that could power 1,125 average size homes per month.

**Industry**
Manufacturing

**Geography**
South Pittsburg, TN

**Annual Energy Spend**
$2.9 million

*https://www.enernoc.com/sites/default/files/media/pdf/case-studies/P14054_CS_Lodge.pdf*

## Key Results & Benefits

- $130,000 in DR payments annually
- $2.3M total savings.
- Visibility into real cost of consumption).

# Customer Spotlight: MGM Industries

**Manufacturer Cuts Costs and Saves Jobs with EnerNOC**

> During the busy times, power optimization was not on our radar screen. Now every dollar saved helps us save jobs. We don't run any equipment we don't have to run. And we've become very conservative, taking a hard look at every expense. Total annual cost savings, thanks to EnerNOC's energy intelligence software, total more than $30,000."

| Industry | Geography | Annual Energy Spend |
|---|---|---|
| Manufacturing | Henderson, TN | <$250,000 |

*https://www.enernoc.com/sites/default/files/media/pdf/case-studies/P14157_CS_mgm_new.pdf*

## Key Results & Benefits

- $12,000 in DR payments annually
- >$30,000 in annual energy cost reductions
- Bottom-line benefits that help MGM thrive in a challenging economy.
- Detailed insights into key energy-consuming equipment.

# Customer Spotlight: U.S. Silica

**Mineral supplier protects its community without affecting its operations**

> “With rising energy costs, a difficult economic climate, and a duty to be environmentally responsible, the TVA-EnerNOC Demand Response program gives us the chance to do something good for the community, the environment, and for our business.”

**Industry**
Mining

**Geography**
Jackson, TN

**Annual Energy Spend**
$500,000

*https://www.enernoc.com/sites/default/files/media/pdf/case-studies/P14055_cs_us-silica.pdf*

## Key Results & Benefits

- $30,000 in DR payments annually
- >$30,000 in annual energy cost reductions
- Bottom-line benefits that help MGM thrive in a challenging economy.
- Detailed insights into key energy-consuming equipment.

# Q&A

# Thank you!

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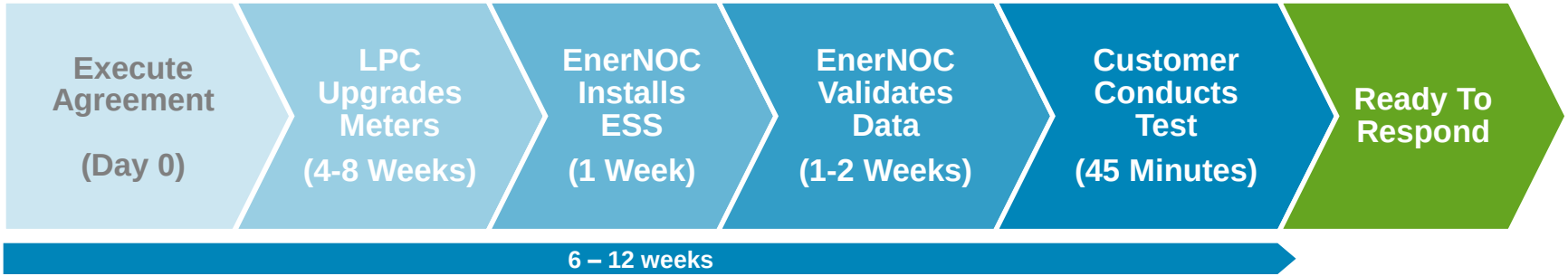
ageshwiler@enernoc.com

# Our NOC and Advanced Technology

Delivering unparalleled visibility, our Network Operations Center is staffed 24x7x365 to monitor potential event triggers throughout the program season, track event performance, and provide coaching during events.

# Enablement Timeline

EnerNOC's DR enablement process is designed to be fast, cost-effective and scalable with an emphasis on customer satisfaction and support.



| Year | Day of Week | Date | Start Time (CST) | End Time (CST) | Duration (hours) |
|---|---|---|---|---|---|
| 2014 | Monday | 6-Jan | 8:00 AM | 1:00 PM | 5 |
| 32 Hours | Tuesday | 7-Jan | 5:00 AM | 11:00 PM | 6 |
| | Tuesday | 28-Jan | 6:00 AM | 10:00 AM | 4 |
| | Wednesday | 29-Jan | 6:00 AM | 10:00 AM | 4 |
| | Tuesday | 4-Mar | 5:00 AM | 8:00 AM | 3 |
| | Monday | 16-Jun | 2:00 PM | 5:00 PM | 3 |
| | Friday | 14-Nov | 6:00 AM | 8:00 AM | 2 |
| | Tuesday | 18-Nov | 6:00 AM | 9:00 AM | 3 |
| | Wednesday | 19-Nov | 6:00 AM | 8:00 AM | 2 |
| 2015 | Friday | 20-Feb | 5:00 AM | 9:00 AM | 4 |
| 28 Hours | Tuesday | 5-May | 2:00 PM | 5:00 PM | 3 |
| | Thursday | 7-May | 2:00 PM | 5:00 PM | 3 |
| | Tuesday | 28-Jul | 12:00 PM | 8:00 PM | 8 |
| | Tuesday | 4-Aug | 2:00 PM | 5:00 PM | 3 |
| | Tuesday | 11-Aug | 3:30 PM | 5:30 PM | 2 |
| | Tuesday | 8-Sep | 3:35 PM | 5:35 PM | 2 |
| | Tuesday | 6-Oct | 4:40 PM | 7:40 PM | 3 |
| 2016 | Wednesday | 10-Feb | 5:00 AM | 9:00 AM | 4 |
| 29 Hours | Thursday | 23-Jun | 1:00 PM | 6:00 PM | 5 |
| | Monday | 18-Jul | 2:00 PM | 5:00 PM | 3 |
| | Monday | 25-Jul | 1:00 PM | 5:00 PM | 4 |
| | Monday | 1-Aug | 2:00 PM | 5:00 PM | 3 |
| | Thursday | 25-Aug | 3:00 PM | 6:00 PM | 3 |
| | Thursday | 22-Sep | 2:00 PM | 5:00 PM | 3 |
| | Friday | 23-Sep | 1:00 PM | 5:00 PM | 4 |
| 2017 | Wednesday | 15-Mar | 5:00 AM | 9:00 AM | 4 |
| 21 Hours | Thursday | 16-Mar | 6:00 AM | 8:00 AM | 2 |
| | Thursday | 18-May | 3:05 PM | 6:05 PM | 3 |
| | Thursday | 13-Jul | 2:00 PM | 6:00 PM | 4 |
| | Thursday | 20-Jul | 2:00 PM | 6:00 PM | 4 |
| | Friday | 22-Sep | 1:00 PM | 5:00 PM | 4 |

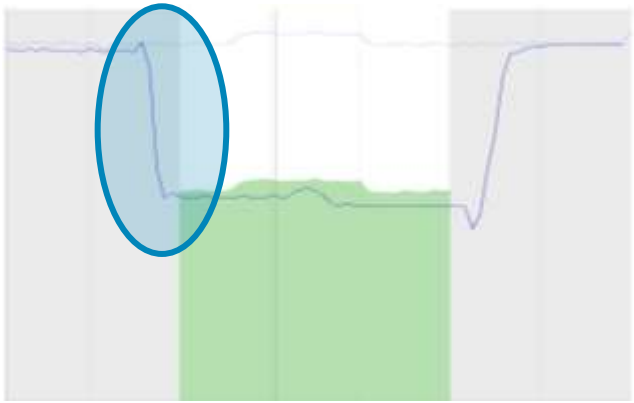
## 31 events have been called in last four years

# Opportunities to Optimize Earnings

# Take Advantage of the 30-Minute Ramp Period

A quick response to dispatches means more in DR earnings

**There is no limit to how much your site can earn in energy payments during the 30-minute ramp period at the start of each dispatch!**



| Dispatch Hours | Committed (kW) | Performance – with Ramp (kW) | Performance – No Ramp (kW) |
|---|---|---|---|
| *30-min ramp* | *N/A* | *229* | *0* |
| 12:00 PM | 600 | 633 | 633 |
| 1:00 PM | 600 | 641 | 641 |
| 2:00 PM | 600 | 592 | 592 |
| 3:00 PM | 600 | 429 | 429 |
| **Total (kw)** | **2,400** | **2,524** | **2,295** |
| **Performance** | | **105.2%** | **95.6%** |